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References

1. Pu S, Han F, Ge B. Isolation and characterization of methicillin-resistant *Staphylococcus aureus* strains from Louisiana retail meats. Appl Environ Microbiol. 2009;75:265–7. doi:10.1128/AEM.01110-08
2. Weese JS, Avery BP, Reid-Smith RJ. Detection and quantification of methicillin-resistant *Staphylococcus aureus* (MRSA) clones in retail meat products. Lett Appl Microbiol. 2010;51:338–42. doi:10.1111/j.1472-765X.2010.02901.x
3. Lim SK, Nam HM, Park HJ, Lee HS, Choi MJ, Jung SC, et al. Prevalence and characterization of methicillin-resistant *Staphylococcus aureus* in raw meat in Korea. J Microbiol Biotechnol. 2010;20:775–8.
4. de Boer E, Zwartkruis-Nahuis JT, Wit B, Huijsdens XW, de Neeling AJ, Bosch T, et al. Prevalence of methicillin-resistant *Staphylococcus aureus* in meat. Int J Food Microbiol. 2009;134:52–6. doi:10.1016/j.ijfoodmicro.2008.12.007
5. Clinical and Laboratory Standards Institute. Methods for dilution antimicrobial susceptibility tests for bacteria that grow aerobically, 7th ed. Wayne (PA): The Institute; 2006.
6. Strommenger B, Cuny C, Werner G, Witte W. Obvious lack of association between dynamics of epidemic methicillin-resistant *Staphylococcus aureus* in central Europe and *agr* specificity groups. Eur J Clin Microbiol Infect Dis. 2004;23:15–9. doi:10.1007/s10096-003-1046-8
7. Smith TC, Male MJ, Harper AL, Kroeger JS, Tinkler GP, Moritz ED, et al. Methicillin-resistant *Staphylococcus aureus* (MRSA) strain ST398 is present in midwestern U.S. swine and swine workers. PLoS ONE. 2009;4:e4258. doi:10.1371/journal.pone.0004258
8. Weese JS, Reid-Smith R, Rousseau J, Avery B. Methicillin-resistant *Staphylococcus aureus* (MRSA) contamination of retail pork. Can Vet J. 2010;51:749–52.
9. Higuchi W, Mimura S, Kurosawa Y, Takano T, Iwao Y, Yabe S, et al. Emergence of the community-acquired methicillin-resistant *Staphylococcus aureus* USA300 clone in a Japanese child, demonstrating multiple divergent strains in Japan. J Infect Chemother. 2010;16:292–7. doi:10.1007/s10156-010-0051-y
10. Larsen AR, Goering R, Stegger M, Lindsay JA, Gould KA, Hinds J, et al. Two distinct clones of methicillin-resistant *Staphylococcus aureus* (MRSA) with the same USA300 pulsed-field gel electrophoresis profile: a potential pitfall for identification of USA300 community-associated MRSA. J Clin Microbiol. 2009;47:3765–8. doi:10.1128/JCM.00934-09

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Suspected Horse-to-Human Transmission of MRSA ST398

To the Editor: Methicillin-resistant *Staphylococcus aureus* (MRSA) is spreading worldwide among humans and animals, including horses. Many reports of MRSA colonization and infection in horses come from Canada and involve MRSA of sequence type (ST) 8, classified by pulsed-field gel electrophoresis (PFGE) as Canadian MRSA-5 or USA500. ST8 is thought to be a human epidemic clone that has adapted to horses (*1*). Another MRSA type, ST398, has recently begun spreading in Europe and North America and is associated with livestock (*2*). In the Netherlands, MRSA of ST8 (*spa*-type t064) and ST398 (*spa*-type t011), which belong to the livestock–associated CC398, predominate in clinical samples from horses (*3*). To date, human clinical infections with livestock–associated MRSA are uncommon in persons who have not had contact with pigs or calves (*2*). In this case study, we describe the suspected transmission of MRSA ST398 between a horse and a girl, which resulted in infection of the girl's right foot.

In the Netherlands, a 16-year-old girl with spinal muscular atrophy type II (wheelchair-bound and needing artificial ventilation) sought treatment at a hospital for an infected wound on her right foot thought to be caused by an insect bite (online Appendix Figure, www.cdc.gov/EID/content/17/6/1137-appF.htm). The girl was treated as an outpatient. The infection did not respond to empirical treatment with clindamycin and ciprofloxacin. From the infected wound, a MRSA strain that was resistant to clindamycin, ciprofloxacin, erythromycin, gentamicin, kanamycin, tetracycline, and trimethoprim/sulfonamide, and susceptible to rifampin and fusidic acid, was isolated 39 days after initial treatment. Identification of the bacteria and susceptibility testing were performed by using Vitek 2 (bioMérieux, Marcy l'Etoile, France). The girl did not have a history of hospital admission in other countries, nor contact with pigs or calves, but had had intensive contact with a foal. No information was available about hand hygiene practices the girl used after stroking the foal.

Because the girl was a frequent visitor to the hospital, according to the national hospital MRSA guidelines, decolonization therapy was indicated. Before therapy began, her 3 household members and their animals (7 adult Friesian horses, 2 dogs, and 2 cats) were screened for MRSA by enrichment culturing. Nasal swabs were taken from the animals; nasal, throat, and perineal samples were taken from the humans. MRSA with an identical susceptibility pattern

was isolated from a sample taken from the nares of the girl's healthy Friesian foal. The foal had been hospitalized at a horse clinic 2 months earlier because of a wound infection and had been treated with antimicrobial drugs, but no samples had been taken from the horse's wound at that time. All other screening samples were negative for MRSA. The girl's wound healed after application of mupirocin ointment to the nares and perineum (3×/d for 5 days), washing of the body with chlorhexidine shampoo (1×/d for 5 days), and oral administration of fusidic acid and rifampin for 7 days; samples taken were negative for MRSA. The girl was advised not to touch the foal until it too was negative for MRSA. Without therapy, and within 3 months, the foal was negative for MRSA (confirmed by 3 repeated negative cultures of nasal samples by enrichment culturing).

Isolates from the girl and the horse were further investigated by Martineau PCR targeting the *tuf* gene (*4*), *mecA* PCR (*5*), ST398-specific PCR (*6*), *spa* typing (*7*), and PFGE using *Sma*I and *Cfr*9I as restriction enzymes (*8*). Both isolates were identified as *S. aureus*, were *mecA* positive, belonged to ST398, were *spa* type t011, were nontypeable by PFGE using *Sma*I, and had indistinguishable PFGE patterns using *Cfr*9I.

Colonization of persons in contact with infected or colonized horses has been widely reported (*1*–*3*). Clinical MRSA infections of humans associated with horse contact, however, are rare and, to our knowledge, only 2 reports have been published. The first report of a human infection came from Canada and concerned a veterinarian who had a tattoo site infection with Canadian MRSA-5, (ST8, SCC*mec* type IV, *spa* type t007) (*9*). Human skin infections with Canadian MRSA-5 associated with horse contact were also reported from 3 persons who worked in a foal nursery (*10*). MRSA ST398 *spa*-type t011 are cultured regularly from equine samples at the horse clinic (*3*); therefore, the foal probably became colonized during its hospitalization. Livestock-associated MRSA infections are rare in humans in the region where the girl lives, and human-to-human transmission of MRSA ST398 is uncommon. In addition, the girl was severely handicapped and could not travel freely. Therefore, we theorize that the foal, which was stabled in a barn at her home, was the most likely source of the infection. It is also possible that the girl and the foal contracted MRSA from an unidentified common source or that the foal was exposed by the girl, although this is less likely. Close collaboration between the pediatrician, infection control practitioner, veterinarians, and the human microbiologist was necessary to identify the suspected source of infection.

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References

1. Weese JS, van Duijkeren E..Methicillin-resistant *Staphylococcus aureus* and *Staphylococcus pseudintermedius* in veterinary medicine. Vet Microbiol. 2010;140:418–29.
2. Catry B, Van Duijkeren E, Pomba MC, Greko C, Moreno MA, Pyörälä S, et al. Scientific Advisory Group on Antimicrobials (SAGAM). Reflection paper on MRSA in food-producing and companion animals: epidemiology and control options for human and animal health. Epidemiol Infect. 2010;138:626–44. doi:10.1017/S0950268810000014
3. van Duijkeren E, Moleman M, Sloet van Oldruitenborgh-Oosterbaan MM, Multem J, Troelstra A, Fluit AC, et al. Methicillin-resistant *Staphylococcus aureus* in horses and horse personnel: an investigation of several outbreaks. Vet Microbiol. 2010;141:96–102. doi:10.1016/j.vetmic.2009.08.009
4. Martineau F, Picard FJ, Ke D, Paradis S, Roy PH, Ouellette M, et al. Development of a PCR assay for identification of staphylococci at genus and species levels. J Clin Microbiol. 2001;39:2541–7. doi:10.1128/JCM.39.7.2541-2547.2001
5. de Neeling AJ, Van Leeuwen WJ, Schouls LM, Schot CS, van Veen Rutgers A, Beunders AJ, et al. Resistance of staphylococci in the Netherlands: surveillance by an electronic network during 1989–1995. J Antimicrob Chemother. 1998;41:93–101. doi:10.1093/jac/41.1.93
6. van Wamel WJ, Hansenová Manásková S, Fluit AC, Verbrugh H, de Neeling AJ, van Duijkeren E, et al. Short term microevolution and PCR-detection of methicillin-resistant and -susceptible *Staphylococcus aureus* sequence type 398. Eur J Clin Microbiol Infect Dis. 2010;29:119–22. doi:10.1007/s10096-009-0816-3.
7. Harmsen D, Claus H, Witte W, Rothganger J, Claus H, Turnwald D, et al. Typing of methicillin-resistant *Staphylococcus aureus* in a university hospital setting by using novel software for *spa* repeat determination and database management. J Clin Microbiol. 2003;41:5442–8. doi:10.1128/JCM.41.12.5442-5448.2003
8. Murchan S, Kaufmann ME, Deplano A, de Ryck R, Struelens M, Zinn CE, et al. Harmonization of pulsed-field gel electrophoresis protocols for epidemiological typing of strains of methicillin-resistant *Staphylococcus aureus*: a single approach developed by consensus in 10 European laboratories and its application for tracing the spread of related strains. J Clin Microbiol. 2003;41:1574–85. doi:10.1128/JCM.41.4.1574-1585.2003
9. Weese JS, Archambault M, Willey BM, Hearn P, Kreiswirth BN, Said-Salim B, et al. Methicillin-resistant *Staphylococcus aureus* in horses and horse personnel, 2000–2002. Emerg Infect Dis. 2005;11:430–5.
10. Weese JS, Caldwell F, Willey BM, Kreiswirth BN, McGeer A, Rousseau J, et al. An outbreak of methicillin-resistant *Staphylococcus aureus* skin infections resulting from horse-to-human transmission in a veterinary hospital. Vet Microbiol. 2006;114:160–4. doi:10.1016/j.vetmic.2005.11.054

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Screening for Pandemic (H1N1) 2009 Virus among Hospital Staff, Spain

To the Editor: After the emergence of pandemic (H1N1) 2009 virus, measures for its control were taken quickly (e.g., isolation of affected patients and use of gowns, gloves, and N95 respirators) when a clinical suspicion of pandemic influenza was established (*1*). One population group frequently exposed to this virus is health care staff. These circumstances prompted us to implement a screening program for the pandemic (H1N1) 2009 virus among personnel working at our hospital in Marbella, Spain.

Costa del Sol Hospital is a 250-bed, second-level center located on the Mediterranean coast. A proposal was made to staff working in the emergency and internal medicine areas that nasal and pharyngeal samples to identify the virus by real-time PCR should be taken weekly over 12 consecutive weeks, from the third week of September 2009 to the third week of December. In addition to providing samples, each worker would be asked to complete a health-status questionnaire regarding his or her vaccination record and the presence of signs or symptoms. Signs and symptoms to be reported in the questionnaires included fever, runny nose, painful swallowing, coughing, sore throat, diarrhea, vomiting, headaches, muscle pains, and general indisposition; 1 question also asked whether, during the previous week, a confirmed diagnosis of influenza with a positive PCR for pandemic (H1N1) 2009 virus had been made in the respondent's household.

At the outset, 60 members of the hospital staff volunteered to participate. Those who missed >4 sample tests, or >2 consecutive ones, were considered to have abandoned the study. Of the 36 staff members who completed the study, 27 were women (75%). The participants' average age was 37 years (CI 95%: 34.8–39.4). Sixteen were doctors, 16 were nurses, 2 were nursing auxiliary staff, and 2 were hospital orderlies. During the monitoring period, 5 (13%) subjects exhibited coughing, 7 (20%) had runny noses, 3 (8%) experienced painful swallowing, 6 (16%) had headaches, and 1 (2%) felt generally unwell. Nearly 75% stated they washed their hands with antiseptic lotion ≥20×/d. Three workers were vaccinated against seasonal and pandemic influenza, while only 1 was vaccinated against pandemic (H1N1) 2009 alone. None took oseltamivir. Five positive samples were identified (13.8% of the study population) being obtained from four doctors and one nurse, all women. The 4 doctors had signs and symptoms for 24–48 hours consisting of fever, general indisposition, and coughing; none of the 4 required hospitalization. The nurse was a woman 26 years of age with no influenza symptoms and with a positive PCR result on week 5. None of these 5 workers had received any influenza vaccination.

Three workers reported that a diagnosis of pandemic (H1N1) 2009 influenza had been made with respect to a member of their household, but none of the workers had a positive PCR result. The distribution of positive PCR results in our hospital during the study is shown in the Figure.

It had previously been hypothesized that the incidence of asymptomatic cases would be higher than the incidence of symptomatic cases (*2*) overall in persons with high exposure (*3*). However, among the study population, only 1 person with positive PCR results was asymptomatic.

Health care workers may have been exposed in a gradual manner from the beginning of the outbreak to a few symptomatic forms, which would explain why so few of them were actually affected. Of the workers in the emergency department who

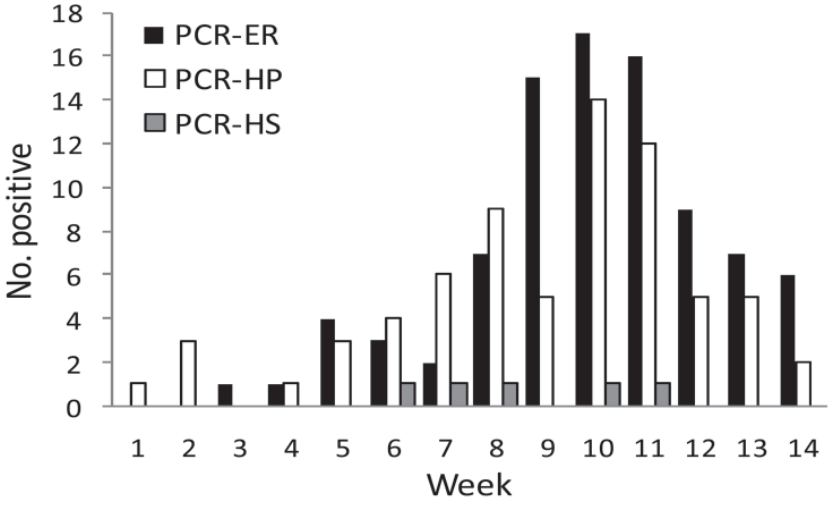

Figure. Number of PCR-confirmed cases of pandemic (H1N1) 2009 virus infection in the emergency department (PCR-ER), hospitalized patients (PCR-HP), and participants (PCR-HS) in a study of screening for pandemic (H1N1) 2009 virus among health care workers, Spain, September–December 2009.